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TO WHAT EXTENT ARE DRAWING AND MANUAL
TRAINING RELATED?

BY

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TO WHAT EXTENT ARE DRAWING AND MANUAL TRAINING RELATED?

Let me say at once that I shall treat my subject frankly from the manual training standpoint. As seen from this point of view, I shall state anew the *purposes* of giving instruction in drawing and the *purposes* of giving instruction in manual training, selecting those more commonly given by interested advocates of these two branches of school work to-day.

What I have to say is very simple and has often been said before; but it sometimes happens that old truths stated in a new way, and especially old truths placed in new relations, assume new significance and have a new value. It is my hope that we may come to some clearer understanding of the relation between drawing and manual training by comparing the various purposes for which they are said to be taught.

The purposes of giving instruction in drawing in, let us say, our public schools, are, as I have gleaned them from various sources, as follows:—

1. To develop the habit of observing, with some care and accuracy, the appearance of the common objects with which we come in daily contact.
2. To develop some facility in expressing graphically the facts thus observed. This facility is thought to be desirable because of the added power which another form of expression naturally gives, because it helps a pupil to clarify his ideas regarding any visible thing, and because it enables him to illustrate other school work.
3. To develop ability to make and to read simple working drawings.
4. To give some acquaintance with color, — knowledge of its theory, appreciation of its effects and practice in its application.

5. To impart some knowledge of great works of art, ancient and modern, usually considered under the heads picture study and historic ornament.

6. To give an insight into the principles of design, including application to material.

7. To develop the æsthetic sense, which enables one, as John Cotton Dana says, "to see clearly, to discriminate and to feel."

What, now, are the alleged purposes of giving instruction in manual training? Let me, parenthetically, call attention to the fact that quite as the word "drawing" very inadequately expresses the purport of the work now done under that head, so the term "manual training" is only in a small degree descriptive of the subject as it is embodied in the school life of to-day.

The purposes of giving instruction in manual training are said to be as follows:—

1. To develop habits of neatness, order and exactness.

2. To afford some facility in the use of tools, and some knowledge of the processes by which common materials are bent and formed and fashioned into the articles with which we daily come in contact. This facility is thought to be desirable because it furnishes added means of expression; because it calls the pupil's attention (to some extent at least) to the inevitable relation of cause and effect; and because it makes possible a greater variety of illustrative school work.

3. To develop manual skill for industrial ends.

4. To provide rich and varied motor training, that increased mental power may result.

5. To provide a rational basis for the study of typical industries.

6. To prolong the school life of some of our pupils by appealing to their natural interest in constructive work, and especially in that which possesses possible industrial value.

I believe that a thoughtful comparison of the purposes of drawing with the purposes of manual training, as here given, will show that in certain respects the subjects are supplementary, while in others they are almost wholly independent.

I shall call attention first to some phases of manual training in which its purposes differ widely from those of drawing. The

benefit to be derived from such consideration here consists mainly in this, — that fuller knowledge of our aims will gain for us respect where sometimes there has been lack of appreciation. This is important, for there must be mutual respect if drawing and manual training teachers are to work together successfully.

You will note that both drawing and manual training are sometimes considered, not as subjects of instruction themselves, but as methods of teaching other subjects. Manual training is an excellent preparation for and an aid in the teaching of physics, for example. Constructive work gives the pupil, at first hand, a knowledge of some of the properties of matter, and the processes involved illustrate some of the laws of physics. A man might have a theoretical knowledge of all the laws of physics, but without some practice in the mechanic arts he would find little opportunity for the application of them.

A moment's reflection will show us what important contributions the mechanic arts have made to nearly all phases of applied natural science, — gravitation, heat, light, electricity, giving us our marvellous means of locomotion, of transmission of power and of communication, and the whole field of optics, including the many varied applications of the microscope, telescope and camera. Without knowledge of mechanical principles and processes the mental attitude of our ingenious inventors would have been impossible, and the intricate and accurate scientific instruments and machines would not have been forthcoming. The foundation of this knowledge of mechanical principles and this possession of mechanical experience is laid by the simple, straight, square, exact work of our manual training, at which our more artistic brothers among the drawing teachers sometimes laugh, and for which they sometimes criticise us. There is, therefore, much of our manual training work which has little evident relation to some of the pictorial or ornamental phases of our art work, but which is none the less artistic within its own sphere.

In this connection may I quote from an address by Mr. Milton P. Higgins, president of the Norton Emery Wheel Company, Worcester, Mass. "It is very important," says Mr. Higgins, "to ask what kind of drawing or art training will

best meet the needs of a manufacturer and the needs of a mechanic. Must it have to do with art culture? Yes; for the mechanic knows art and he appreciates culture, but it must be his kind of art and his kind of culture, — still, art and culture just the same. Must it have to do with beauty? Yes; for he, the mechanic, loves the beautiful, but not always the same beauty that the landscape artist loves, but beauty just as surely."

If I could, I would paint you a word picture of a beautiful landscape, rich in color and vibrant with light, and I would ask you to try to realize the paucity of the soul which could not receive pleasure from its contemplation. Poor also is he who can listen to one of Beethoven's sublime symphonies without being thrilled by its beauty and grandeur. But what of the man who can stand unmoved before a Corliss engine, which is so perfectly designed and so accurately constructed that it silently does the work of five hundred horses? Does not he also lack something of complete appreciation of the beautiful? It is this kind of beauty, I think, to which Mr. Higgins refers.

I have intimated that drawing teachers may occasionally overlook the importance of certain phases of our manual training work. On the other hand, it is undoubtedly true that manual training teachers sometimes fail to appreciate the value of some of the drawing, the final results of which must be sought for in the developed æsthetic sense which enables one "to see clearly, to discriminate and to feel."

An examination of those forms of manual training which have been given for the specified purpose of developing mental power will show another instance in which manual training has been developed independently of drawing. In this connection it is necessary to examine briefly the historical or social setting of the manual training movement.

Two generations ago the majority of our youth were growing up in rural districts, in villages or in small towns. Even those in the more highly educated classes had only a few weeks' schooling, were in close contact with nature, and had ample opportunity for useful and varied manual work. Incidentally they became acquainted with whatever industrial life there was in their immediate environment.

On the other hand, those who were preparing for an indus-

trial life were cared for by the apprenticeship system then in vogue, which provided not only for instruction in the chosen trade, but, at the same time, for a certain amount of schooling. In neither case were children taken from life to be educated for life, but a rational and intimate relationship was maintained between work and study. According to Mr. William Noyes of Teachers' College, it is the present mission of our schools to re-establish this relationship between work and study. I have heard many men speak on the subject of manual training in the last fifteen years, and, without exception, the men of great breadth of view and of profound learning have emphasized the importance of manual training in this particular. Men differing as widely in their educational work as Dr. Dunton, formerly of the Boston Normal School, Dr. G. Stanley Hall and Dr. Nicholas Murray Butler, have all insisted that this combination of work and study produced men and women of superior mental and moral fiber, and that it is the chief purpose of manual training to re-establish the true balance between manual work and book work.

The recent report of the Massachusetts Commission on Industrial and Technical Education says:—

City life instead of rural life, life in tenements and flats instead of in houses, together with the increase of wealth, have combined to deprive great numbers of children of these opportunities for industrial activity which were inseparable from life on the farm. Well-to-do people are everywhere lamenting that there is nothing for their children to do. The children are always receiving and never giving. Food, clothing, shelter, education, amusement,—all come to them as freely as the air and the sunshine.

The effects of these changes repeatedly brought to the attention of the commission are not most serious where we might naturally expect, in a lack of manual efficiency, though that is marked, but on the intellectual and moral side. There is a one-sided sense of values, a one-sided view of life and a wrong attitude toward labor. Not having any share in productive labor, and being out of touch with it, the youth have no standards by which to measure time or possessions or pleasures in terms of cost. Many persons believe that about this point center some of the gravest present-day social problems.

No summary, however brief, of the influences which have inspired and modified the manual training movement, should

fail to include some mention of the contribution made by those who studied the question from the standpoint of physiological psychology. Briefly stated, their conclusions were as follows: The larger part of the brain is that which is affected by and which controls motor activity. The larger part of the motor area of the brain is that which is related to the hand. Therefore, much use, and especially the varied and purposeful use, of the hand results in a development of the motor area of the brain, and, by association or contagion, as it were, in the improvement of the whole mental structure. The chief aim of manual training, according to this theory, is to multiply and enrich the motor experiences. The well-developed brain is one which possesses a great variety of motor memories. It is safe to say that this theory has materially affected the practices of scores of manual training teachers. I am inclined to believe, however, that it has far less influence to-day than it had ten years ago, and that the more obvious social and industrial purposes are controlling or shaping our manual training work. I submit, however, in so far as the above theory is valid and valuable, in so far as the important thing is to increase and enrich the motor memories, that manual training must be governed by other considerations than the correlation with drawing.

It is, however, in those phases of drawing and manual training which are supplementary that we are most vitally interested, and I turn with pleasure from the foregoing somewhat academic discussion to two practical considerations.

The report of the Commission on Industrial and Technical Education shows that drawing and manual training had a common origin in the schools of Massachusetts, as both were authorized by legislative enactments which were prompted solely by industrial considerations. If we can accept the conclusions of the commission, neither has served to any considerable extent the end for which it was authorized; both have gone wide of the mark and both share in the common condemnation. The report says: "The result has been that drawing in the schools has become more and more exclusively cultural in its purpose and method, and the original industrial purpose has been largely lost sight of." It also says: "The wide indifference to manual training as a school subject may be due to the

narrow view which has prevailed among its chief advocates. It has been urged as a cultural subject, mainly useful as a stimulus to other forms of intellectual effort, a sort of mustard relish, an appetizer, — to be conducted without reference to any industrial end. It has been severed from real life as completely as have the other school activities. Thus it has come about that the overmastering influence of school traditions has brought into subjection both the drawing and the manual work."

This is a somewhat gloomy picture, or it is a challenge, as you choose to look at it. Let us, with this stinging criticism in mind, take up some of the purposes previously mentioned, and see if, by *combining* the forces of drawing and manual training, we cannot make both more vital.

Take three of the previously expressed purposes of drawing: —

1. To develop the habit of observing the appearance of common objects.

2. To develop some facility in expressing these facts graphically.

3. To develop the ability to make and to read working drawings.

I believe that there is a relation between drawing and manual training, regarding the formation of habits of observation and the development of facility in graphic expression, which is generally overlooked. I also believe that, because the relation between manual training and the working drawing is so obvious, it is often over-emphasized or misinterpreted.

In English composition it is thought best to require children to write about matters of their own experience, because they will then express *themselves*, not merely repeat words in a parrot-like fashion. In the same way, drawing teachers would do well to have the children make perspective drawings of the models they are to make or have made in the manual training room, because these models are of immediate and vital interest to them. The facts of form are important to them, and, if they are somewhat familiar, they are *somewhat* new, which cannot be said of the type solids.

Instead of making perspective sketches of the manual training models, pupils are generally required to make careful working drawings of them. This *seems* logical, but I believe it is

unreasonable. Ultimately we wish our pupils to have the ability to make and to read working drawings. It is as illogical to have the children read only the drawings which they themselves have made as it would be to have them read only such English as they themselves had written. The *reading* of working drawings can best be taught by the manual training teacher. Carefully prepared drawings should be furnished for most of the models in the earlier years of the work; and the manual training teacher fails in his full duty every time he tells his pupils a fact of form or dimension which can be learned from the drawing.

To *make* a working drawing, one must have the ability to work with some accuracy, and must understand the method of representing, by two or more so-called "views," the facts of form and dimension of an object just as they are, not as they seem, — in a word, orthographically.

The ability to *work accurately* can be better developed by constructive work than by pencil and straight-edge; and this ability can be put to practical use in drafting at twenty-five as well as at twelve. In constructive work the child experiences the shock of misfit. I borrow the expression from Dr. Frank McMurtry, who tells interestingly about receiving such a shock himself while attempting to fit a screen door. The problem was simple: an opening of a given size, a screen door slightly larger than the opening, — plane the door until it was the same size as the opening. He says: "It is only when one has experienced the shock of the misfit between what he has thought will hold, on the one hand, and what he finally finds to be true, on the other, — it is only then that one is really sharpened to the point of developing good judgment." Children rarely experience this shock from inaccuracies in their drawing.

The understanding of the *method* of orthographic projection is a feat of the imagination, and can be gained at twelve better than at twenty-five. It can be gained better by making ten free-hand sketches in an hour, orthographically, than by making one such drawing mechanically, — mechanically as to the drawing, and also mechanically as to the understanding of it; for it takes the beginner so long to express the thought that soon there is no thought to express.

Therefore, have pupils make pictorial drawings of their

manual training models. Teach the methods of orthographic projection apart from manual training, employing free-hand sketches and numerous models, and let the manual training teachers teach the reading of working drawings.

I believe that the most vital relation of drawing and manual training, however, is indicated in the two following purposes: (1) it is an expressed purpose of manual training to prolong the school life of our pupils by providing constructive work of a possible industrial value; (2) it is an expressed purpose of drawing to give an insight into the principles of design, including application to material. It is precisely here that neither drawing nor manual training has been able, *alone*, to fulfill the expectations of its friends and advocates. Working *together*, there is promise of satisfactory results.

It is worth while for us to appreciate the fact that the industrial phases of our work are receiving much attention at this time. The last program of the department of superintendence of the National Educational Association gave much time to the subject, as did the program of the joint session of the Eastern Art Teachers Association and the Eastern Manual Training Association. More recently the National Society for the Promotion of Industrial Education was organized in New York, with addresses by many prominent men and women. The Social Education Congress, which was convened for the first time in Boston last November, also gave prominent place to the consideration of industrial education.

The subject of the applied arts has also received much attention, and one frequently hears such phrases as "the applied arts and their relationship to life," or "applied design as related to industry." Notwithstanding that much has been said about it, the problem of industrial education is far from being solved, for it is a most complicated one. Those who talk learnedly about it have no solution to offer. Some claim that it is not the business of the schools to try to solve the problem; but I believe that it is a problem, both for our industrial interests if they are to maintain even the present mediocre standards, and for our educational institutions if they are to hold their place in the esteem of the people at large as an important factor in our national existence.

There is grave danger, if the working out is left entirely to

the industrial interests, that they may carry over into the shop-school the features of present industrial methods which are least desirable, — such, for example, as the subdivision of labor and the training for great efficiency of effort in a very limited field. There would also be a tendency to become over-technical and ultra-utilitarian. I believe that it is precisely at this point that the educational institutions will tremendously affect the problem by bringing to bear the combined forces of drawing and manual training. The educational institutions, by their very traditions, will tend to uphold the idea that the industrial demands will not be met by the development of manual skill alone in one set of people and of taste and appreciation alone in another set. Skill alone might result in the ability to turn out a larger amount of ugly work, and to flood the market with goods that are attractive simply because they are cheap. Taste and appreciation alone frequently result only in criticism of our own, and praise of other times and people. The industrial ends will best be served by that training which enables the worker to appreciate, even if he does not actually participate in, the entire process from design to finish. It is this all-round training toward which the schools will naturally tend.

It remains to make some suggestion as to how the schools are to attack the problem. Of course the best way — the only way — is to train competent teachers. These teachers *will be trained*, — if not by normal schools, then by some other agency; but they will be trained. The fact remains that there are not to-day a sufficient number of teachers trained in both manual and art work to materially affect the problem, and the problem is a *present* problem. Therefore, what is needed immediately is the co-operation of our present forces of drawing and manual training. Mr. John Cotton Dana, librarian of the Newark Public Library, says: "This is already evident, — that the teacher of drawing and art in the schools is going to get the strongest and best argument for the continuance and the expansion of her work from the relations it will have with things made with the hands." In all grades we see teachers of drawing trying, and rightly trying, to carry the drawing, the design, over into construction; but in all grades, especially in the higher, we find these teachers hampered by their lack of knowl-

edge and experience regarding materials, tools and processes of construction. We find them ignoring the manual training room, with its equipment of tools and its teacher, who, by training and experience, probably has the ability to work in several kinds of material. We find them improvising tools and processes whose only recommendation is that they are ingenious. Metal work, for example, has thus been done with a pair of scissors, a bottle and a nail. It is especially true in high schools that the drawing teacher, who has the ability and the training to enable her to teach the designing for half a dozen lines of work, confines herself to one, because in that one she has the knowledge which permits her to teach, as well, the application of the design to material. What is needed here is the co-operation of a good, all-round, manual training teacher.

On the other hand, we find the manual training teacher who has become dissatisfied with the making of abstract practice pieces, or "useful models" of doubtful utility, reaching out into the world of real things, and trying to design furniture, etc., ignoring the drawing department, with its technical knowledge of design, and relying for suggestions on catalogues of manufacturers, or on the drawings of other teachers as untaught in the arts as himself.

Dr. Hale's great word "together" is the great word here also. I believe that the barrier which has kept the two school activities apart has been personal rather than technical. There has generally been an attempt of one to absorb the other, or of the other the one. There has been professional jealousy, and, worst of all, misunderstanding of the other's purpose and point of view. It is of first importance that drawing and manual training teachers should be brought to realize their dependence each on the other. Neither should be subordinated to the other. Over-prominent self-respect should give place to mutual respect; and it will, when it is understood by each that the other has something without which *he* cannot do his best work.

With right understanding between the two, there will always be conference as to questions of time, ability of the worker, limitations of the material, etc., before any project is begun. There will be co-operation throughout the entire process, and joint satisfaction in the finished product.

There will also be an effort on the part of both to learn something of the "economic idea." There is no time to consider that subject here; but the "economic idea" involves questions of organization for work, concentration of effort, elimination of waste and a consideration of values, — time value, value of material, and the value of good workmanship. And may I express the belief, in closing, that manual training will make an important contribution to art in the schools in this very matter of good workmanship. To one engaged in the finer kinds of machine tool work it is a common matter to deal with measurements of one one thousandth of an inch or less. In speaking of this fact, I have often noticed the look of incredulity in the faces of those who have had no experience in such work. In the same way it is incomprehensible to one untrained in the refinements of art that the beauty of a curve may be destroyed or the perfect rhythm of a design be missed by the deviation of a line by so little as a hair's breadth. Even though untrained in art, one can the more readily accept this latter statement as a fact because he has had experience with the former. And so I believe that the person who has learned to have respect for clean-cut, accurate work, honest construction and good finish, — in short, for good workmanship, — will have become more discriminating in regard to the arts, and will have refined, to that extent, whatever else he has otherwise acquired of the æsthetic sense.

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